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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/720,325

11/24/2003

Ping Hsu

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09/01/2005

QUINTERO LAW OFFICE
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EXAMINER

SARKAR, ASOK K

ART UNIT

PAPER NUMBER

2891

DATE MAILED: 09/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/720,325	Applicant(s) HSU, PING	
	Examiner Asok K. Sarkar	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 and 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15-22 is/are allowed.
- 6) ☒ Claim(s) 1, 11-14 and 29 is/are rejected.
- 7) ☒ Claim(s) 2-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1, 11 – 14 and 29 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. Claim 1 is objected to because of the following informalities: In line 10, following the word "portion", the word "of" should be inserted. Appropriate correction is required.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 11, 13, 14 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Divakaruni, US 6,440,793.

Regarding claims 1 and 29, Divakaruni teaches a method of fabricating a trench device structure with a single-side buried strap, comprising the steps of:

- providing a semiconductor substrate having a deep trench therein (see Fig. 4);
- forming a buried trench capacitor 42 in a lower portion of the deep trench with reference to Fig. 5;
- forming a collar insulating layer 36 lining an upper portion of the deep trench;

- forming a first conductive layer 42 overlying the buried trench capacitor the trench and surrounded by and lower than the collar insulating layer by a predetermined height (see Fig. 5);
- removing a first portion of the collar insulating layer 36 from the deep trench to expose a first portion of the semiconductor substrate while a second portion of the collar insulating layer remains to isolate a second portion the semiconductor substrate (see Fig. 5);
- forming a second conductive layer (strap polysilicon) overlying the first conductive layer 42 in the deep trench, wherein the second conductive layer is lower than the surface of the semiconductor substrate (see Fig. 5); and
- forming the single – side buried strap region 31 in the semiconductor substrate directly contacting the second conductive layer without isolation by the collar insulating layer 36 by performing a thermal treatment to form a buried strap region on the semiconductor substrate directly contacting the second conductive layer without isolation by the collar insulating layer (see Fig. 5) in descriptions between column 4, line 28 and column 5, line 2.

Regarding claim 11, Divakaruni teaches the collar insulating layer is composed of tetra ethyle ortho silicate (TEOS) inherently formed by chemical vapor deposition (CVD) in column 4, lines 34 – 46.

Regarding claim 13, Divakaruni teaches the first and second conductive layers are composed of doped polysilicon in column 4, lines 53 – 67.

Claim Rejections - 35 USC § 103

Art Unit: 2891

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Divakaruni, US 6,440,793 in view of Schrems, US 6,008,104.

Regarding claim 12, Divakaruni, US 6,440,793 fails to teach the thickness of the collar insulating layers.

Schrems teaches that the collar insulating layers are generally 200 – 300 Angstroms thick (column 6, line 35) for the benefit of manufacturing a trench capacitor with reduced charge leakage and increased capacitance in column 2, lines 46 – 50.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Divakaruni's capacitor and build the collar insulating layers to be within 200 – 300 Angstroms thick for the benefit of manufacturing a trench capacitor with reduced charge leakage and increased capacitance as taught by Schrems in column 2, lines 46 – 50.

Allowable Subject Matter

6. Claims 15 – 22 are allowed.
7. Claims 2 – 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
8. The following is a statement of reasons for allowance and the indication of allowable subject matter:

These claims recite, inter alia, a method of fabricating a trench device structure with a single-side buried strap, comprising the steps of performing a tilt ion implantation on undoped polysilicon or amorphous silicon layer, wherein a portion of the undoped polysilicon or amorphous silicon layer in the deep trench is not implanted, selectively wet etching the undoped polysilicon or amorphous silicon layer, thereby exposing the underlying lining layer, sequentially etching the exposed lining layer and the contiguous collar insulating layer expose a portion of the semiconductor substrate using the doped polysilicon or amorphous silicon layer as a mask, and removal of the remaining lining layer and the doped polysilicon or amorphous silicon layer. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William B. Baumeister can be reached on 571 272 1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

Art Unit: 2891

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink that reads "Asok Kumar Sarkar". The signature is written in a cursive, flowing style.

Asok K. Sarkar
August 31, 2005

Primary Examiner